LOWS.

The general direction of the paths has been on a higher parallel of latitude than in the case of the highs. Lows Nos. V, VI, and VII began on the north Pacific Coast; Nos. I and IV began to the north of Montana; Nos. II, III, and VIII began in the central valleys. All the storms, without exception, disappeared over Newfoundland or in the permanent low area of that region.

CLIMATOLOGY OF THE MONTH.

By A. J. HENRY, Chief of Division of Records and Meteorological Data.

GENERAL CHARACTERISTICS.

The month opened with an area of cloud and rain over the lower Mississippi Valley and Gulf States, a region, it will be remembered, in which heavy rains fell during March and April of the current year. Since that time no general storm has originated in or passed over the Gulf States. The rains in the interim have been light and sporadic, and the water in the rivers in many cases has reached as low a point as ever before recorded. At the close of the month there was a notable deficiency of precipitation over all of the country from the Carolinas southward and westward to Oklahoma and Texas. On the other hand, an abundance of rain fell in the Ohio Valley from Cairo to the lower Lake Region; also in New England and generally over the northern Pacific Coast, extending as far eastward as Montana.

Temperature was generally above normal, the only important exception being on the central and north Pacific Coast and over the northern plateau where it was below normal. Killing frost was general throughout Mississippi and Alabama on the 30th, and light to killing frost occurred at many points in Louisiana on the same date. Light frost occurred at New Orleans on the 18th and at Mobile on the 19th.

The first half of the month was an unusually stormy period in the Lake Region, but the number of storms during the last half was not greater than the average for the season.

The most severe storm of the month prevailed on the north Pacific Coast from the morning of the 17th to the morning of the 19th. The anemometer at the Fort Canby station registered 2,380 miles of wind, an average velocity of 63 miles per hour between 11 p. m. of the 16th and 2 p. m. of the 18th, thirty-eight consecutive hours. The wind blew with the greatest velocity (over 70 miles per hour) during the last six hours of the storm's duration.

Some damage was done by the wind at inland points, but the greatest destruction was occasioned by floods in small streams and rivers. Railroad travel was greatly interrupted by landslides, washouts, and destruction of bridges. Fortunately a fall in temperature on the 20th checked what might otherwise have been a very destructive flood throughout Washington and Oregon.

ATMOSPHERIC PRESSURE.

[In inches and hundredths.]

Pressure was below normal over practically the whole Plateau Region and the north Pacific Coast, the greatest deficit being at Walla Walla, Wash. Elsewhere it was above normal, especially in Assiniboia and Manitoba.

The distribution of mean atmospheric pressure reduced to sea level, as shown by mercurial barometers, not reduced to standard gravity, and as determined from observations taken daily at 8 a. m. and 8 p. m. (seventy-fifth meridian time), is shown by isobars on Chart IV. That portion of the reduction to standard gravity that depends on latitude is shown by the numbers printed on the right-hand border.

The numerical values of Table I should be consulted for additional details.

TEMPERATURE OF THE AIR.

[In degrees Fahrenheit.]

Except in the upper half of California, the northern portion of Oregon, thence northward to the boundary line and eastward to Lake Superior, November was warmer than usual. The departures from the normal were not great in any district save over north-central Montana where the average daily deficit was about 10°. There were no very severe cold waves, and the month as a whole presented no striking features as regards temperature.

The mean temperatures and the departures from the normal, as determined from records of the maximum and minimum thermometers, are given in Table I for the regular stations of the Weather Bureau, which also gives the height of the thermometers above the ground at each station. The mean temperature is given for each station in Table II, for voluntary observers.

The *monthly mean temperatures* published in Table I, for the regular stations of the Weather Bureau, are the simple means of all the daily maxima and minima; for voluntary stations a variety of methods of computation is necessarily allowed, as shown by the notes appended to Table II. The mean temperatures given in Table III for Canadian stations are the simple means of 8 a. m. and 8 p. m. simultaneous observations.

The *regular diurnal period* in temperature is shown by the hourly means given in Table V for 29 stations selected out of 82 that maintain continuous thermograph records.

The *distribution of the observed monthly mean* temperature of the air over the United States and Canada is shown by the dotted isotherms on Chart IV; the lines are drawn over the Rocky Mountain Plateau region, although the temperatures have not been reduced to sea level, and the isotherms, therefore, relate to the average surface of the country occupied by our observers; such isotherms are controlled largely by the local topography, and should be drawn and studied in connection with a contour map.

The *years of highest and lowest mean temperatures* for November are shown in Table I of the REVIEW for November, 1894. The mean temperature for the current month was neither the highest nor the lowest on record at any regular station of the Weather Bureau.

The *maximum and minimum temperatures* of the current month are given in Table I. The highest maxima were: 92, Los Angeles (18th); 88, Yuma (2d), Phœnix (19th); 86, Corpus Christi (8th), San Antonio (11th); 85, Jupiter (1st); 84, Abilene (3d), Palestine (15th), Dodge City (20th). The lowest maxima were: 49, Marquette (3d); 54, Sault Ste. Marie (3d), Fort Canby (18th); 55, Eastport (6th); 56, Duluth (2d); 57, Portland, Me., (4th); 59, Detroit (frequently). The highest minima were: 67, Key West (4th); 58, Jupiter (3d); 50, Tampa (13th); 49, Port Eads (2d). The lowest minima were: —26, Miles City (28th); —21, Havre (28th); —19, Williston and Huron (29th).

The *years of highest maximum and lowest minimum temperatures* for November are given in the last four columns of Table I of the REVIEW for November, 1896. During the current month the maximum temperatures were equal to or above

the highest on record at: Williston, 69; La Crosse,* 72; Des Moines, 76; Columbia, Mo., 80; Kansas City, 79; Miles City, 76; Denver,* 77; Dodge City, 84; Wichita, 83; Amarillo, 82; El Paso, 83; Carson City, 72; Baker City, 65; Idaho Falls, 64. The minimum temperatures were equal to or below the lowest on record at: Miles City, —26; Wichita, 7; Point Reyes Light, 41; Fresno, 28.

The *greatest daily range of temperature and the data for computing the extreme and mean monthly ranges* are given for each of the regular Weather Bureau stations in Table I. The largest values of the greatest daily ranges were: Rapid City, 54; Pueblo, 53; Bismarck and Winnemucca, 52; Havre, 50. The smallest values were: Key West, 10; Fort Canby, 13; Astoria and Jupiter, 18; Port Angeles, San Francisco, Marquette, and Woods Hole, 19; Hatteras, 20.

Among the *extreme monthly ranges* the largest were: Miles City, 102; Havre, 92; Huron, 91; Williston and Pierre, 88; Bismarck, 87; Yankton, 86. The smallest values were: Key West, 16; Fort Canby, 20; San Francisco, 24; Jupiter, 27; Astoria, 28; Point Reyes Light, 29.

Considered by districts the mean temperatures of the current month show departures from the normal as given in Table I. The greatest positive departures were: southern and middle Plateaus, 2.2 and 2.1, respectively. The greatest negative departures were: North Dakota, 5.6; Northern Slope, 2.7.

In Canada.—Prof. R. F. Stupart says:

The distribution of mean average temperature for November is not unlike, in many respects, that of its predecessor of 1896, but the amounts above and below average are not so great as they then were. In 1896 the temperature from the Rockies to Lake Superior, starting from the former, ranged from 27° to 9° below the average, whilst this year it is, over the same stretch of country, from 13° to 3° below the average. In British Columbia it then varied from 9° to 24° below the average; from Vancouver Island to the Selkirks now it is from 1° to 12° below. In 1896 southern Ontario was from 3° to 5° above the average; this year it is from 1° to 3° above. There was, however, a noticeable difference in the Maritime Provinces. Last November it was from 1° to 3° above average, and this month it is from average to 2° below.

Accumulated monthly departures from normal temperatures from January 1 to the end of the current month are given in the second column of the following table, and the average departures are given in the third column, for comparison with the departures of current conditions of vegetation from the normal condition.

Districts.	Accumulated departures.		Districts.	Accumulated departures.	
	Total.	Average.		Total.	Average.
	°	°		°	°
New England	+ 4.7	+ 0.4	Florida Peninsula	— 1.4	— 0.1
Middle Atlantic	+ 3.1	+ 0.3	Southern Plateau	— 4.3	— 0.4
South Atlantic	+ 4.5	+ 0.4	Middle Plateau	— 4.6	— 0.4
East Gulf	+ 7.8	+ 0.7	North Pacific	— 1.0	— 0.1
West Gulf	+14.2	+ 1.3	Middle Pacific	— 4.7	— 0.4
Ohio Valley and Tenn.	+ 9.0	+ 0.8	South Pacific	— 7.9	— 0.7
Lower Lake	+ 8.5	+ 0.8			
Upper Lake	+18.7	+ 1.7			
North Dakota	+ 2.5	+ 0.2			
Upper Mississippi Valley	+14.7	+ 1.3			
Missouri Valley	+13.7	+ 1.2			
Northern Slope	+ 2.4	+ 0.2			
Middle Slope	+12.8	+ 1.2			
Southern Slope	+ 3.6	+ 0.3			
Northern Plateau	+ 9.5	+ 0.9			

FROST.

Following is a summary of reports by directors of the respective climate and crop sections south of latitude 37°:

Alabama.—Light frost was quite general in northern section on the 5th to the 14th, inclusive, 19th, 20th, and 21st; in southern section on the 3d, 4th, 7th, 10th, 17th, 18th, and 19th. Killing frost was general in northern section on the 2d and 3d, 12th and 13th, 15th to 20th, 24th, 26th, 28th, and 30th; in southern section, 17th to 20th, inclusive, the first killing of season occurring at Montgomery and as far south as Washington County on the 18th, and as far south as Conecuh and Monroe counties on the 30th. No killing frost was reported at Mobile up to the close of November, though light frost occurred at that station on the 3d, 4th, and 19th.

Arizona.—The first killing frost or the first freezing temperature of the month was reported at different points in the southern half of the State on the following dates: 4th, 7th, 8th, 9th, 25th, and 28th.

Arkansas.—Killing frost was general over the State on the 2d and 3d, 10th, 16th, and 17th, and was reported from a few places the 6th, 11th, 12th, and 18th.

Florida.—Light frosts reported from Washington, Gadsden, Baker, and Duval counties on the 4th, 12th, and 13th. The tenderest plants, however, were uninjured.

Georgia.—Light frost occurred at a number of places in various parts of the State on the 9th, 10th, 11th, 14th, 28th, 29th, and 30th, and was general on the 2d, 4th, 12th, 13th, 18th, 19th, and 20th. Killing frost was reported from the northern section of the State on the 3d, 4th, 5th, 10th, 12th, 13th, and 14th, and was general over the northern and middle sections from the 16th to the 20th, inclusive. Between the 23d and 30th killing frost occurred at a number of places in the northern section and at a few places in the southern section on the 30th.

Louisiana.—There were general frosts throughout the State on the morning of the 17th and near the coast on the 18th.

Mississippi.—Light frost occurred generally over the State, except the Gulf Coast, on the 2d and 3d, and was reported from various localities on the 4th, 6th, 9–13th, 15th, 17–20th, 24th, 28th, and 29th. Killing frost formed over the entire State on the 30th, and was reported from localities in the central and northern portions as early as the 3d.

North Carolina.—Light frosts occurred generally on the 2d, 4th, 5th, 7th, 11th, 12th, 13th; killing frosts occurred generally on the 13th, 18th, 19th, 20th, 24th, 29th, and 30th.

Oklahoma.—The first killing frost, at South McAlester, occurred on the night of the 16th. The first general killing frost of the season was reported on the morning of the 2d, destroying all tender vegetation.

South Carolina.—Killing frost occurred at a few places on the 12–13th, but the first general killing frost of the season occurred on the 18–19th, and 24th, except along the immediate coast, where no killing frosts were noted.

Texas.—The dates of light frosts were as follows: 1st–6th, 8th, 10th, 11th, 17–20th, 22d, 24th, 26–30th. Heavy frosts on the 1st, 16th, and 19th. Killing frosts on the 2d, 15–20th, 25th, and 27–30th.

PRECIPITATION.

[In inches and hundredths.]

Precipitation was unusually heavy on the north Pacific Coast, in eastern Washington and Idaho, and in the Ohio Valley, the lower Lake Region, the Middle States, and New England. Generally less than an inch was recorded at the majority of stations in Florida, Georgia, Alabama, and throughout central Mississippi. Light rains for the season fell in eastern Tennessee, southern West Virginia, and throughout the coast regions of the Carolinas.

Considered by districts the rainfall of the current month was below normal in 12 and above in the remaining 9; the largest excess was 4.70 on the north Pacific Coast; the greatest deficiency was 2.60 on the west Gulf. The values for all districts are shown in Table I.

In Canada.—Professor Stupart says:

At Esquimault, on Vancouver Island, the rainfall was 7.2 inches, being 1.0 inch below the average. Over a large portion of Manitoba the average precipitation for November was not reached, neither was it over the greater portion of the Muskoka District and the Ottawa Valley. Parry Sound and Sprucedale recorded 1.6 and 1.1 inch, respectively, less than the usual amount in the former, and Rockliffe 0.4 less in the latter region. In all other portions of Canada (not, however, considering the mainland of British Columbia, the reports received from this Province being from stations more recently established) the precipitation was generally in excess of the average, and in many localities to a considerable amount. In the Northwest Territories, where precipitation is usually so light, it was exceeded by over an inch in many places and even to an extent of over 2.0 inches. In Ontario, the Niagara Peninsula gave the greatest amount above average; Stony Creek recorded a total fall of 6.6 inches, being 3.6 inches above average. The heaviest general rainfall of the month occurred in the district embracing the Bay of Fundy; St. John recording 6.9 inches, Grand Manan, 8.3; Yarmouth, 7.4, being 2.2, 2.9, and 3.2 inches above the average, respectively.

The *years of greatest and least precipitation* for November are given in the REVIEW for November, 1890. The precipi-

*Observations cover a period of twenty-five years, or more.